NARRATIVE NUTRIENT CRITERIA

Rule

Surface Water Use Designations (IDAPA 58.01.02.200)

> ***06. Excess Nutrients.*** *Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses.*

Discussion

Aquatic ecosystems require certain nutrients like nitrogen and phosphorus to support plant growth and animal life. These nutrients are the basic food supply of aquatic organisms such as algae and periphyton which, in turn, form the base for higher trophic levels (e.g., macroinvertebrates and fish). Without nutrients, water bodies throughout the state would be devoid of life. However, addition of nutrients to a water body (eutrophication) from human sources, known as cultural eutrophication, becomes problematic when it leads to excess algae and plant growth.

When high concentrations of nutrients lead to excess algae and plant growth (a.k.a. hypereutrophication) negative impacts to the biological communities can occur. Excessive algae and plant growth may lead to depletion of dissolved oxygen levels because of nighttime respiration by living algae as well as the bacterial decomposition of dead algae/plant material (EPA, 2000a). This depletion of dissolved oxygen has an adverse effect on the macroinvertebrate populations and can lead to fish kills. Furthermore, significant increases in plant growth may cause changes in the pH of the water as plants and algae remove dissolved carbon dioxide during photosynthesis. Hypereutrophication may also change taste and odor characteristics of water, thereby increasing the costs of treating it for drinking water (Newton et al., 1999).

Enrichment of surface waters from the influx of nutrients such as phosphorus and nitrogen has been an enduring dilemma for water quality management agencies across the nation. EPA established the National Nutrient Criteria Program to address this issue. In a May 2007 Memorandum, the assistant director of the U.S. EPA called on States and Tribes to step up their efforts in developing numeric nutrient criteria (Grumbles, 2007).

The EPA has been striving to develop national nutrient criteria. According to EPA's Assessment and Tracking database, nutrients are the third most common cause of impairment for rivers and streams and the second most common cause of impairment in lakes and reservoirs (EPA, 2014). In October 1997, a Clean Water Action Plan (CWAP) was initiated by EPA to address nutrient over-enrichment in the nation's surface waters. The CWAP includes the development of water quality nutrient criteria as one of its components. In choosing to regulate nitrogen and

phosphorus concentrations, it is inherently assumed that these nutrients regulate the growth of algae. The plan called for the development of region-specific nutrient criteria for different types of water bodies, so as to account for the wide natural variation in nutrients that are found around the country. In the January 9, 2001 Federal Register notice, EPA recommended that states and authorized tribes develop a nutrient criteria plan to outline their process for how and when they intend to adopt nutrient criteria into their water quality standards. In 2000 and 2001 EPA released water quality criteria recommendations for nutrients in lakes, reservoirs, rivers and streams. These recommended reference values were classified by water type (flowing vs. non-flowing) and by aggregate level 3 Omernik ecoregions. Idaho's two aggregate ecoregions are the Xeric West (EPA, 2000a; EPA, 2000b) and the Western Forested Mountains (EPA, 2001c; EPA, 2001d).

EPA recommends three options for developing nutrient criteria:

1. Develop nutrient criteria that fully reflect localized conditions and protect specific designated uses, using EPA's Technical Guidance Method;
2. Adopt EPA's 304(a) Criteria Recommendations; or
3. Develop a unique system.

DEQ intends on using the flexibility suggested by EPA in developing a plan for nutrient criteria that is scientifically defensible, specific to the unique conditions in Idaho, and considerate of stakeholder concerns. While lakes have been studied more extensively, only a few studies of flowing systems have addressed relationships between nutrient levels, algal biomass and beneficial uses. There are distinct differences in the way these two types of water bodies react to increased nutrient loads. Flowing waters typically can assimilate higher concentrations while non-flowing waters (lakes and reservoirs) become areas where nutrients accumulate. Lakes and reservoirs typically serve as nutrient sinks because of the tendency for nutrients to accumulate in the water column and more so in the sediments. Increased nutrient concentrations in lakes and reservoirs, and to some extent slow-flowing rivers, may lead to problems such as harmful algal blooms.

In discussions with other Region 10 states, it has become apparent to DEQ that other states are struggling with many of the same problems, and there is no clear consensus on how plans should be developed for rivers and streams. Based on the flexibility from EPA in their November 2001 memo and the paucity of available data to make an appropriate plan for exactly how criteria will be set, there is a need to analyze existing data on nutrients and algal communities in the state and devise a sampling plan for collecting additional data to assess the relationships among nutrient levels, algal growth, and designated uses.

Most nutrient monitoring in Idaho has focused on project-specific results for short durations on publicly significant lakes, reservoirs and larger rivers. Lake, reservoir and stream data that would provide a broad ecoregional perspective for development of nutrient criteria are needed.

Additional information on nutrients and algal production may need to be collected in order to support development of regional nutrient criteria. Idaho does not expect simply to adopt EPA's 304(a) criteria. Instead, DEQ anticipates using a combination of options 1 and 3. EPA nutrient criteria guidance documents along with other relevant guidance documents will be used for establishing goals, developing a conceptual model, data screening, and evaluation of expected conditions.

EPA recognized that states have specific priorities for nutrient criteria development and offered the flexibility to prioritize state waters in a way other than by the EPA ecoregions (Grubbs Memo, 2001). Therefore, Idaho anticipates using a phased approach for developing nutrient criteria. The first step is interpreting Idaho's narrative nutrient criteria.

Idaho currently has a narrative nutrient criterion which states that waters "shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses". Studies conducted in 2004 and 2013 were aimed at defining better what is meant by "excess nutrients", "visible slime growths" or "other nuisance aquatic growths" for streams with an eye towards developing a guidance for assessing water bodies with potential nutrient issues.

DEQ is developing a potential four step process. While this process has not been used, it is currently being explored through the 2013 monitoring for nutrient effects project. The first step is typically reserved for data submitted from outside agencies/groups/individuals, whereas DEQ would likely start at step two.

Step 1: Trigger values for phosphorus, nitrogen, cyanotoxins or public complaints are defined

a. Data shows an exceedance of a numeric value (TBD) for phosphorus or nitrogen,
b. Data shows an exceedance of a numeric value (TBD) for toxic algal blooms, or
c. Public complaints for a water body indicate a problem exists with either recreational, domestic water supply or aquatic life uses.

Step 2: Response variables are monitored and assessed

a. Chlorophyll a (benthic in flowing waters and water column in lakes and reservoirs),
b. Ash Free Dry Mass in flowing waters, benthic measurement,
c. Stream Diatom Index, River Diatom Index, Trophic State Index,
d. Dissolved Oxygen (diel sags below criterion), or
e. Visual Assessment.

Step 3: Source Analysis

a. Identify possible sources of anthropogenic sources, or
b. Subbasin Assessment if complete should point out any anthropogenic sources.

Step 4: Listing Decision

a. Document decisions made during process,

b. If process did not identify specific nutrient species (e.g., started with BURP data showing impaired aquatic life community), list as combined biota until specific nutrient species can be identified, and
c. List in the next available cycle of the Integrated Report.

As data from the 2004 and 2013 studies are analyzed this potential assessment process will be refined and possible nutrient endpoints may be identified which would inform decision about possible numeric nutrient criteria in Idaho.

References

EPA, 1996. National Summary of Water Quality Conditions. *Report.* U.S. Environmental Protection Agency. Washington, D.C.

EPA, 2000a. National Water Quality Inventory Report. *Report.* EPA-841-R-02-001. U.S Environmental Protection Agency. Washington, D.C.

EPA, 2000b. Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion II. *Report.* 822-B-00-015. U.S. Environmental Protection Agency. Washington, D.C.

EPA, 2000c. Ambient Water Quality Criteria Recommendations: Lakes and Reservoirs in Nutrient Ecoregion II. Report EPA-822-B-00-007. U.S. Environmental Protection Agency. Washington, D.C.

EPA, 2000d. Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion II. Report EPA-822-B-00-015 U.S. Environmental Protection Agency. Washington, D.C.

EPA, 2001a. Ambient Water Quality Criteria Recommendations: Lakes and Reservoirs in Nutrient Ecoregion III. Report EPA-822-B-01-008. U.S. Environmental Protection Agency. Washington, D.C.

EPA, 2001b. Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion III. Report EPA-822-B-00-016. U.S. Environmental Protection Agency. Washington, D.C.

EPA, 2014. National Summary of State Information. Accessed online at http://ww.ofmpub.epa.gov/waters10/attains_nation_cy.control on Aug. 14, 2014.

Grubbs, G. 2001. Development and Adoption of Nutrient Criteria into Water Quality Standards. *Memorandum*. S.W.P. Directors, U.S. Environmental Protection Agency. Washington, D.C.

Grumbles, B. 2007. Nutrient Pollution and Numeric Water Quality Standards. *Memorandum.* S. W. P. Directors. U.S. Environmental Protection Agency. Washington, D.C.

Newton, B. J. and W. M. Jarrell. 1999. A Procedure to Estimate the Response of Aquatic Systems to Changes in Phosphorus and Nitrogen Inputs. *Report.* U.S. Department of Agriculture. Washington, D.C.